Trefftz-DG discretization for the Stokes problem

Paul Stocker[1]   Philip L. Lederer[2]   Christoph Lehrenfeld[3]

We introduce a new discretization based on a polynomial Trefftz-DG method for solving the Stokes equations. Discrete solutions of this method fulfill the Stokes equations pointwise within each element and yield element-wise divergence-free solutions. Compared to standard DG methods, a strong reduction of the degrees of freedom is achieved, especially for higher polynomial degrees. In addition, in contrast to many other Trefftz-DG methods, our approach allows us to easily incorporate inhomogeneous right-hand sides (driving forces) by using the concept of the embedded Trefftz-DG method. We present a detailed a priori error analysis and numerical examples.

References:

[1] https://doi.org/10.1007/s00211-024-01404-z

[1]University Of Vienna, Faculty of Mathematics, Austria
  `paul.stocker@univie.ac.at`

[2]Department of Applied Mathematics, University of Twente, Netherlands
  `p.l.lederer@utwente.nl`

[3]Institute for Numerical and Applied Mathematics, University of Göttingen, Germany
  `lehrenfeld@math.uni-goettingen.de`